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A Study of the Relationship Between Admissions Scores and Subsequent Achievement at Brownell-Talbot School

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A STUDY OF THE RELATIONSHIP BETWEEN ADMISSIONS SCORES AND SUBSEQUENT ACHIEVEMENT AT BROWNELL-TALBOT SCHOOL

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Chapter I

INTRODUCTION

Standardized intelligence and achievement testing has been the center of considerable controversy.[1] Critics of testing have included parents, school boards, legislative bodies, and civil rights organizations.[2] Even national news commentators have attempted to expose the I.Q. as a myth.[3]

Independent schools rely upon standardized intelligence and achievement tests as a major component in the admission of new students. It is imperative that educators involved in making decisions regarding the future education of children recognize the limitations of standardized test results as well as their usefulness as predictors of future achievement. In addition to or in place of testing assessments dealing solely with the cognitive domain, there is support for consideration of attitudes, motivation, personality traits, and creativity as important determiners of

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[1]Alexandra Young Baldwin, "Tests Can Underpredict: A Case Study," Phi Delta Kappan, LIX (April, 1977), p. 620.

[2]Anne Anastasi, Psychological Testing (3rd ed.; New York: MacMillan Company, 1968), p. 548.

[3]Diane Ravitch, "The I.Q. Myth - Criticisms, Complexities, Contradictions," New York Times, April 20, 1975, Sec. D, p. 29, cited by Robert L. Ebel, "Educational Tests: Valid? Biased? Useful?" Phi Delta Kappan, LVIII (October, 1975), p. 87.

achievement in all areas.[4]

Brownell-Talbot School, an independent school with grades pre-kindergarten through twelve, uses student scores on the Otis-Lennon Mental Ability Test (1967) and the arithmetic computation and paragraph meaning sections of the Stanford Achievement Test (1964) as guidelines for determining whether an applicant will be admitted. A minimum I.Q. of 100 and an average of the fifth stanine on the achievement sub-tests are used as minimum criteria for acceptance to the School. While these tests of learning ability and achievement are usually satisfactory, the question arises as to whether the mental ability score or the achievement scores alone correlate best with future achievement. A primary concern is what factors or combination of factors best predict achievement at Brownell-Talbot School.

PURPOSE OF THE STUDY

The purpose of this study was to determine the relationship, if any, between applicants' scores on the tests used for entrance to Brownell-Talbot School and their subsequent achievement patterns as determined by teacher assigned grades and subsequent standardized achievement testing.

The study was undertaken with the null hypothesis that there was no correlation between the standardized

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[4]Anastasi, op. cit., p. 555.

admissions test scores and subsequent achievement. The hypothesis was tested at the five per cent and the one per cent levels of confidence, with plans to reject the hypothesis at the five per cent level.

LIMITATIONS

This study was limited to applicants for the seventh, eighth, ninth, and tenth grades at Brownell-Talbot School from September 1975 through September 1979. Only those students who were accepted by the School and attended at least one semester were considered.

Measures of achievement were limited to the year-end academic grades assigned by teachers of English and mathematics courses and to the scores earned by students on the mathematics computation and total reading sections of the Comprehensive Testing Program (CTP).

DEFINITIONS

Intelligence Quotient

Intelligence quotient (I.Q.) is defined as the Otis-Lennon Deviation I.Q. which "is a normalized standard score with a mean of one-hundred and a standard deviation of sixteen points."[5]

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[5]Arthur S. Otis and Roger T. Lennon, Otis-Lennon Mental Ability Test: Manual for Administration (New York: Harcourt, Brace and World, Inc., 1967), p. 15.

Correlation Coefficient

A coefficient of correlation is a "quantitative measure of the degree and direction of relationship existing between two (or more) variables."[6] This study utilized Pearson's product-moment coefficient.

Achievement

Achievement is measured by teacher assigned year-end academic grades in English and mathematics courses and by scores earned on the total reading and mathematics computation sections of the Comprehensive Testing Program administered during the spring following matriculation.

SIGNIFICANCE

The author's intent is to present this study to the administration of Brownell-Talbot School. After reviewing the findings and recommendations of the study, the administration may present a recommendation to the Board of Trustees of the School to revise the admissions testing procedure and guidelines for admission to the school or to continue the present policy.

PROCEDURE

Data were gathered from students' cumulative files.

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[6]Victor H. Noll, Introduction to Educational Measurement (2nd ed.; Boston: Houghton Mifflin Company, 1965), p. 483.

Coefficients of correlation were determined between (1) the Otis-Lennon I.Q. scores and academic grades in mathematics, (2) the Otis-Lennon I.Q. scores and academic grades in English, (3) scores on the paragraph meaning section of the Stanford Achievement Test (SAT) and the academic grades assigned for English class, (4) scores on the arithmetic computation sub-test of the SAT and the academic grades in mathematics class, (5) student academic grades in English and the total reading section of the Comprehensive Testing Program (CTP), and (6) student academic grades in mathematics and the mathematics computation sub-test of the CTP.

The academic grades were teacher assigned year-end grades. The Otis-Lennon Mental Ability Test and the Stanford Achievement sub-tests were administered prior to the applicant being accepted to Brownell-Talbot School while the Comprehensive Testing Program sub-tests were administered during April following a student's matriculation.

ORGANIZATION

In succeeding chapters, the aspects of the study that have been described briefly in the first chapter have been considered in detail. A review of related literature comprises Chapter II. A more detailed description of the nature of the procedures used is given in Chapter III. Chapter IV presents a display of the data, and Chapter V offers a summary, conclusions, and recommendations.

Chapter II

RELATED LITERATURE

One of the aims of this project was to determine, through examination of a variety of sources, the correlation between standardized test scores and future academic success as determined by teacher-assigned grades. A bibliography of the more valuable sources consulted can be found at the end of this report.

Despite the abundance of information on standardized testing, information of sufficient specificity to be of practical value to this study was difficult to locate. Many sources contained discussions of the merits, and more frequently the criticisms, of ability and achievement testing and suggested other factors to consider in predicting achievement. Only a few described the validity of using these alternatives to predict future achievement. Accordingly, this review of literature reflects a similar emphasis.

The information extracted from the sources has been categorized into three broad areas. The first includes a summary of the literature describing the predictive validity of ability and achievement testing and the relationship between the two. The second summarizes research concerning the validity of teacher-assigned marks in assessing

achievement. The third describes other factors suggested for predicting future achievement.

ABILITY AND ACHIEVEMENT TESTING

Testing has attracted the attention of writers, editors, test sellers, and the general public. Newspaper and magazine articles have been written on the pros and cons of standardized tests, and "people write books about testing and then go on television shows to debate the subject."[1] Much of the controversy surrounding standardized testing involves skepticism of the use or misuse of the results, particularly the I.Q. score. Educators debate whether ability testing or achievement testing are better predictors of future achievement or if they measure the same thing.

Ability tests in particular have been attacked and for a variety of reasons. One is the debate over what intelligence tests are actually designed to measure and even the definition of intelligence. Perhaps Thorndike's claim "that intelligence is what intelligence tests measure"[2] sums up the problem.

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[1]William W. Turnbull, "Testing for Guidance and Selection," Readings in Educational and Psychological Measurement, ed. Clinton Chase and H. Glenn Ludlow (Boston: Houghton Mifflin Company, 1966), p. 299.

[2]Clinton Chase and H. Glenn Ludlow, Readings in Educational and Psychological Measurement (Boston: Houghton Mifflin Company, 1966), p. 151.

I.Q. tests do not test native ability directly, but rather learned achievement.[3] Many people view I.Q. as an indicator of potential, when in fact "the tasks on some group tests of intelligence are indistinguishable from tasks on a general achievement test."[4]

Factor analysts, following Thurstone and Guilford, "claimed that intelligence is not a unitary general ability, but a collection of numerous independent kinds of ability or primary factors, verbal, spatial, number, etc."[5] Glasser and Bloom believe that I.Q. tests are predictive of achievement "only in a monolithic educational system."[6] However, they agree that "the intelligence factor gives us useful educational predictions in so far as children may usually be expected to be able to apply reasoning capacities built up outside school to tackling any new topic in school."[7]

Standardized ability tests have been accused of

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[3]Robert L. Ebel, "Educational Tests: Valid? Biased? Useful?," Phi Delta Kappan, LVI (October, 1975), p. 87.

[4]Ibid.

[5]Robert L. Green, "Tips on Educational Testing: What Teachers and Parents Should Know," Phi Delta Kappan, LVI (October, 1975), p. 91.

[6]P. E. Vernon, "Intelligence Testing and the Nature/Nurture Debate, 1928-1978: What Next?," British Journal of Educational Psychology, 49 (1979), p. 3.

[7]Ibid., p. 12.

underprediction, especially for lower income or minority children.[8]

Due to the changeability of the environment and "to cultural biases built into tests, tests are not perfect predictors of a child's learning ability for future academic success."[9] This premise is supported by Baldwin's study of twenty-four black children in the fifth grade who were selected for a special class for gifted children although they would not have qualified for the program using conventional I.Q. and achievement criteria. These children benefited greatly from this program, and the levels of measured ability differed from a mean I.Q. of 110.6 before to 127.7 after participating in the program.[10]

What kind of a predictor of future achievement is I.Q.? In Stanford professor Lewis Terman's study of 1,529 California children whose average I.Q. was 150 points and were studied for fifty-three years, "the high I.Q. children did better in school than their classmates, but mainly in the subjects of reading and arithmetic."[11] Seventy per cent of those

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[8]William M. Boyd, II, "SATS and Minorities: The Dangers of Underprediction," Change (November, 1977), p. 49.

[9]Green, op. cit., p. 91.

[10]Alexinia Baldwin, "Tests Can Underpredict: A Case Study," Phi Delta Kappan, LVIII (April, 1977), pp. 620-21.

[11]Benjamin Fine, The Stranglehold of the I.Q. (New York: Doubleday, 1975), pp. 233-34.

studied finished college, compared to eight per cent of their counterparts. Approximately forty per cent of the male graduates earned law, medical or Ph.D degrees.[12] Although these results were impressive, Terman added that "intellect and achievement are far from perfectly correlated."[13] Romanow agrees primarily because "scores on a intelligence test do not always coincide with school performance . . . because the test represents only a small portion of what the child may know or be able to do."[14]

Based on their own studies, Cattell and Butcher believe that general ability is the most important predictor of school achievement.[15] However, there seems to be a feeling that there is much overlap between the content of ability and achievement testing.[16] Coleman and Cureton describe this as the 'jangle fallacy': "the use of two separate words or expressions covering in fact the same basic situation, but sounding different, as though they were in truth different."[17]

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[12]Ibid., p. 234. [13]Ibid.

[14]Concetta V. Romanow, "The Teacher, the Child, and the Intelligence Test," Chicago Schools Journal (Febr., 1969), p. 214.

[15]Raymond Cattell and H. J. Butcher, The Prediction of Achievement and Creativity (Indianapolis: Bobbs-Merrill Company, Inc., 1969), p. 13.

[16]Romanow, op. cit., p. 215.

[17]William Coleman and Edward Cureton, "Intelligence and Achievement: The 'Jangle Fallacy' Again," Chase and Ludlow, op. cit., pp. 173-74.

They contend that the traits measured by intelligence tests and achievement tests overlap about ninety per cent. Their study showed that the Otis Quick-Scoring Test Beta and the Word Meaning, Paragraph Meaning, and Arithmetic Computation sub-tests of the Stanford Achievement Test measure substantially identical functions.[18]

Not all agree with the 'jangle fallacy.' "Experience from studies of the selection for secondary schools in Britain strongly suggests that a test of general intelligence, given at age eleven, is more effective in predicting school attainment than tests in English or arithmetic."[19]

In research undertaken by Cattell, "the prediction of success as measured by the Stanford Achievement Test, intelligence was the most important single factor, supported principally by two personality factors: Superego Strength and Conscientiousness."[20]

MARKING

Educators were found on both sides of the issue of the validity of teacher-assigned marks or grades as an indicator of achievement. "Standards of achievement are often

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[18] Ibid.

[19] Cattell and Butcher, op. cit., p. 51.

[20] Ibid., pp. 198-99.

thought of as the teacher's estimate of the level of achievement that a pupil must reach before he has done acceptable work."[21] Clearly, there is support for the use of final marks as an indicator of achievement.

Odell found that the validity of teacher-assigned marks as a meaning of mastery of subject matter is fairly high, probably on the average at least a .70 correlation coefficient.[22] This coefficient was supported in a summary of studies by Ahlmann and Glock "concerning the correlation between final marks in question and (1) other marks in the same subject matter area, (2) test scores from appropriate standardized tests, and (3) the pupils' estimates of the marks they deserved."[23]

Many colleges and universities have found that school grades are one of the best means of predicting college success, whether used alone or as a part of a prediction battery.[24] A study conducted in the Republic of Ireland concluded "that

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[21]J. Stanley Ahlmann and Marvin D. Glock, Evaluating Pupil Growth: Principles of Tests and Measurements (5th ed.; Boston: Allyn and Bacon, Inc., 1975), p. 373.

[22]C. W. Odell, "Marks and Marking Systems," Encyclopedia of Educational Research, (3rd ed.; New York: MacMillan Company, 1950), p. 713, cited by Robert W. Ebel, Essentials of Educational Measurement (3rd ed.; Englewood Cliffs, N.J.: Prentice Hall, Inc., 1979), p. 232.

[23]Ahlmann and Glock, op. cit., p. 380.

[24]Turnbull, op. cit., p. 304 and Ahlmann and Glock, op. cit., p. 381.

even in the absence of standardized test score results, teacher judgements of students' intelligence and mathematics and English attainment tap a dimension similar to that tapped by standardized tests."[25] However, "grades reflect qualities not present in tests, such as staying power and willingness to accept and complete assignments. Since they reflect repeated observations by many teachers over time, they come to have some stability."[26]

There is not complete agreement among researchers as to the validity of marks. Teacher-assigned marks are criticized for their lack of clearly defined standards and objective evidence used in assigning the marks.[27] Robert W. Ebel, former president of the American Educational Research Association and past vice president of the Educational Testing Service, was critical of Odell's values of validity for semester marks. He claimed that Odell's evidence was indirect and inadequate. He also noted that "the lack of clearly defined, uniform bases for markings and standards for the meanings of various marks tends to allow biases to lower the validity of

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[25]Joseph Pedulla, Peter Airasian, and George Madaus, "Teacher Ratings and Standardized Test Results," American Education Research Journal, 17 (Fall, 1980), p. 307.

[26]Turnbull, op. cit., p. 304.

[27]Robert W. Ebel, Essentials of Educational Measurement (3rd ed.; Englewood Cliffs, N.J.: Prentice Hall, Inc., 1979), p. 232.

marks."[28]

Other studies have concluded that girls are more likely to get higher marks than boys of equal ability and achievement,[29] and students well-liked by teachers tend to receive higher marks than students of equal ability and achievement who were not as well-liked.[30] Although, the latter appears to be contradicted. The results of a study by Pedulia, Ariasian, and Madaus found that social behaviors such as manners, politeness, and behavior in school did not relate very highly with teacher ratings of I.Q., mathematics, and English.[31]

CREATIVITY

"Some test critics have argued that, because of their limited coverage of intellectual functions, intelligence and scholastic aptitude tests tend to perpetuate a narrow conception of ability."[32] Often college admissions testing excludes

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[28]Ebel, Essentials of Educational Measurement, p. 233.

[29]Robert S. Carter, "How Invalid Are Marks Assigned by Teachers?," Journal of Educational Psychology, 43 (1952), pp. 218-28, cited by Ebel, Essentials of Educational Measurement, p. 233.

[30]Trevor Hadley, "A School Mark--Fact or Fancy?," Educational Administration and Supervision, 40 (1954), pp. 305-312, cited by Ebel, Essentials of Educational Measurement, p. 233.

[31]Pedulla, Ariasian, and Madaus, op. cit., p. 12.

[32]Anne Anastasi, Psychological Testing (3rd ed.; New York: MacMillan Publishing Co., 1976), p. 555.

able persons whose intellectual talents lie in other directions. Creativity research has identified both cognitive and personality variables that are associated with creative productivity.[33] Prediction of achievement has been accused of being too exclusively academic.[34]

Creativity is a term used to include "the scientific discovery, artistic production, musical composition, technological invention, political and social innovation, literary creation, and even religious leadership."[35] History has shown that people with high I.Q. scores are not necessarily those who become successful political leaders, writers, artists, scientists, musicians, or successful businessmen and women. Winston Churchill, Albert Einstein, and Louis Pasteur are prominent and often cited examples.[36] Studies by Torrance, Guilford, Taylor, Getzels, and Jackson "have shown that the creative child is not necessarily academically gifted as measured by the conventional I.Q. scale."[37]

The Otis-Lennon, for example, was one of the tests cited as commonly used to measure a child's I.Q. but which does not measure "creativity, imagination, curiosity or potential leadership. As presently conducted and utilized, the I.Q. tests screen out a large proportion of creative children."[38]

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[33] Ibid.

[34] Cattell and Butcher, op. cit., p. 11.

[35] Ibid., p. 268.

[36] Fine, op. cit., p. 197.

[37] Ibid., p. 198.

[38] Fine, op. cit., p. 198.

The question is what relationship, if any, exists between intelligence and creativity. Torrance, Barron, and Mackinnon found that "to a certain level (approximately an I.Q. of 120), intelligence and creativity are remarkably hard to distinguish; but that above this level, creative abilities attain a steadily increasing importance."[39]

In a study by Wallach and Kogan, "a significant finding was that a correlation did not exist between intelligence, as measured by the I.Q. test, and creativity, as shown in the test of originality and uniqueness. A creative child was just as likely to have a low I.Q. as a high one. The researchers found that the chances that a child of high intelligence would also display high creativity were no more than fifty-fifty, or merely a chance relationship without significance."[40]

"Getzels and Jackson compared a group of highly intelligent with a group of highly creative children. Despite a mean difference of twenty-three points in I.Q. and no ascertainable difference in motivation, the highly creative group reached the same level of achievement in school."[41]

An interesting adjunct was that the creative group was not equally favored by teachers.[42] High I.Q. students

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[39]Cattell. op. cit., p. 301.

[40]Fine, op. cit., pp. 216-17.

[41]Cattell, op. cit., p. 267. [42]Ibid., p. 198.

were favored by their teachers when asked to select students they would like to have in their classroom.[43]

Dr. Torrance, "considered to be one of the nation's foremost authorities in the field of creative education,"[44] reported a wide range of coefficients of correlation between intelligence and creativity measures. "The relationships were especially low in samples consisting predominantly of high ability children or adults. They were highest in samples consisting largely of low ability students where motivation and test taking attitudes and skills rather than intelligence anc creative ability were perhaps the common factor."[45] Torrance has never attempted to make a clear distinction between intelligence and creative thinking, as separate variables.[46]

Creativity studies have been criticized due to the lack of research into the correlation with the I.Q. tests.[47] Dr. Torrance's creativity tests are also called "unreliable because they are based upon 'so-called' creativity tests for which there is no evidence of validity, and that the link between test performance and real-life achievement does not exist

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[43]Fine, op. cit., p. 206.

[44]Ibid. p. 198.

[45]E. Paul Torrance, "Creativity Research in Education: Still Alive," Perspectives in Creativity, Irving Taylor and J. W. Getzels, eds. (Chicago: Aldine Publishing Company, 1975), p. 287.

[46]Ibid.

[47]Quinn NcNemar, "Lost: Our Intelligence. Why?," Chase and Ludlow, op. cit., pp. 191-92.

and cannot be measured."[48]

SUMMARY

As the preceding review indicates, there appears to be little consensus on the use of one particular factor over others as the best predictor of future achievement. There are proponents and opponents of testing for ability, achievement, and creativity. The logical conclusion is to combine two or more tests as indicators.

Anastasi admonishes that "for an adequate picture of the individual's mental functioning, these tests should be supplemented with data from other sources, including other types of tests, behavioral observations, and biographical-history information. Information on productive thinking and creativity would also be desirable."[49] Cattell believes that adding personality and motivation measures results in improvement in the prediction of scholastic achievement.[50]

While standardized testing and marking systems have come under criticism from educators and the public, it is important not to underestimate their importance in education today. These scores and grades have assisted educators for

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[48]Fine, op. cit., p. 201.

[49]Anastasi, op. cit., p. 574.

[50]Cattell, op. cit., p. 14.

purposes of placement, retention, recognition, and growth measurement. As the literature points out, they should not be the only factors considered.

Chapter III

PROCEDURE

The purpose of the study was to determine the relationship, if any, between applicants' scores on the tests used for admission to Brownell-Talbot School and their subsequent achievement patterns at the School as determined by teacher-assigned grades and subsequent standardized achievement tests. The entrance testing included the Otis-Lennon Mental Ability Test and the paragraph meaning and arithmetic computation sections of the Stanford Achievement Test (SAT). The total reading and mathematics computation sections of the Comprehensive Testing Program (CTP) were used for the subsequent achievement testing. Only teacher-assigned academic grades for English and mathematics classes were considered.

DATA COLLECTION

The first step in implementing the study was to identify the names of the one hundred-four present and former Brownell-Talbot students who made application and enrolled in the seventh, eighth, ninth, and tenth grades at the School during the school years 1975-76 through 1979-80. A listing by name of students entering the School during those years was not previously available. Only students who completed at least one semester and finished the school year in which

they began were considered in the study. Scores and grades were collected from these students' cumulative files.

The data collected from each student's file included the Otis-Lennon I.Q. score, the raw scores on the paragraph meaning and arithmetic computation sections of the Stanford Achievement Test, the raw scores on the mathematics computation and total reading sections of the Comprehensive Testing Program, and teacher-assigned academic grades in English and mathematics classes. The Otis-Lennon and Stanford Achievement Tests were administered prior to each student's admission to the School. The Comprehensive Testing Program was administered during April of the student's year of matriculation. The academic grades were those assigned by the appropiate classroom teacher in May as an appraisal of the student's achievement in that subject for the school year just completed. At Brownell-Talbot academic grades are assigned as "A," "B," "C," "D," and "F." For the computational purposes of this study, letter grades were converted to numbers according to the following system. "A" = 4.0, "B" = 3.0, "C" = 2.0, "D" = 1.0, and "F" = 0.0.

STATISTICAL PROCEDURES

Correlations were then calculated between (1) the Otis-Lennon I.Q. scores and academic grades in mathematics classes, (2) the Otis-Lennon I.Q. scores and academic grades in English classes, (3) scores on the paragraph meaning

section of the Stanford Achievement Test and academic grades in English, (4) scores on the arithmetic computation section of the SAT and academic grades in mathematics class, (5) scores on the total reading section of the Comprehensive Testing Program and academic grades in English class, and (6) scores on the mathematics computation section of the CTP and academic grades in mathematics class.

A scatter diagram, correlation chart, was constructed for each category of variables mentioned above. By inspection the scatter diagrams made apparent that the relationship between each of the pairs of variables mentioned was rectalinear, or a straight line regression. Therefore, it was appropriate to use Pearson's product-moment coefficient of correlation for each relationship studied.[1] Pearson's correlation coefficient r_{xy} was computed from ungrouped original measurements according to the formula

$$r_{xy} = \frac{N\Sigma XY - (\Sigma X)(\Sigma Y)}{\sqrt{[N\Sigma X^2 - (\Sigma X)^2][N\Sigma Y^2 - (\Sigma Y)^2]}}$$

where X and Y are original scores in variables x and y, and N is the number of pairs of scores.[2]

The number of scores used in the comparisons varied. All 104 new students were given the Otis-Lennon, but only

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[1] J. P. Guilford, Fundamental Statistics for Psychology and Education (4th ed.; New York: McGraw Hill Book Company, 1965), pp. 107-108.

[2] Ibid., p. 97.

93 students were given the Stanford Achievement Test prior to admission. It was not a policy to administer both tests before school year 1977-78. The number of scores available for the CTP was 92 rather than 104 since twelve new students took the CTP during October rather than during April following their matriculation.

To insure a sufficiently broad data base, the applicants were considered in total rather than grade by grade when computing the correlation coefficients. This grouping provided an adequate sample size. The scores used for admission to grades seven through ten were obtained from the same level and form of the standardized tests: Otis-Lennon Mental Ability Test, Intermediate Level, Form J (1967) and the Stanford Achievement Test, Advanced Battery, Form W (1964). Correlation coefficients were also computed grade by grade for one sample. The coefficients by grade did not differ significantly from the correlation coefficient obtained for the group. This test supported the decision to calculate the coefficient of correlation for the applicants from grades seven through ten combined.

Once a Pearson's product-moment correlation coefficient was calculated for each pairing of variables considered in this study, the coefficients were tested for significance. A t-ratio was evaluated for each coefficient of correlation and then compared to a table of t-ratios significant at the .05 and .01 levels. The formula used for computing t-ratios

is $t = \frac{r_{xy}\sqrt{N - 2}}{\sqrt{1 - r^2_{xy}}}$.[3]

Correlation coefficients with t-ratios significant at the .05 level[4] resulted in rejection of the null hypothesis for that coefficient.

SUMMARY

In summary, past and present students who enrolled at Brownell-Talbot School from 1975-76 through 1979-80 in grades seven through ten were identified. From student files, scores were collected from the Otis-Lennon Mental Ability Test, the paragraph meaning and arithmetic computation sections of the Stanford Achievement Test, and the total reading and mathematics computation sections of the Comprehensive Testing Program, as well as year-end academic grades in English and mathematics courses. Using a formula for Pearson's product-moment coefficient of correlation, the Otis-Lennon was compared to both grades in English and mathematics classes. The paragraph meaning and arithmetic computation sections of the SAT were compared to English and mathematics grades respectively.

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[3]William S. Ray, Basic Statistics (New York: Appleton, Century, Crofts, 1968), p. 129.

[4]Guilford, loc. cit.

A t-ratio was computed for each correlation coefficent and compared to a table of t-ratios significant at the .01 and .05 levels to determine whether the null hypothesis should be rejected for any of the pairs of variables.

Chapter IV

CORRELATION COEFFICIENTS AND SIGNIFICANCE

To determine the relationship, if any, between applicants' scores on tests required for entrance to Brownell-Talbot School and subsequent achievement at the School, a null hypothesis was tested for six pairs of variables. Correlation coefficients and t-ratios were calculated for (1) the Otis-Lennon I.Q. scores and academic grades in mathematics, (2) the Otis-Lennon I.Q. scores and academic grades in English, (3) scores on the paragraph meaning section of the Stanford Achievement Test (SAT) and the academic grades assigned for English class, (4) scores on the arithmetic computation sub-test of the SAT and the academic grades in mathematics class, (5) student academic grades in English and the total reading section of the Comprehensive Testing Program (CTP), and (6) student academic grades in mathematics and scores from the mathematics computation sub-test of the CTP. The t-ratios were tested for significance at the .05 and .01 levels. The null hypothesis was to be rejected at the .05 level of significance.

SUMMARY STATISTICS

Of the 104 students used in the sample, thirty students

entered the seventh grade, sixteen students entered the eighth grade, thirty-two students entered the ninth grade, and fifteen students entered the tenth grade.

In grades seven through ten, eight applicants enrolled during school year 1975-76, twenty-nine enrolled during school year 1976-77, twenty-one enrolled during 1978-79, and twenty-five enrolled during 1979-80.

The I.Q. scores for the sample ranged from 90 to 140. The mean I.Q. score was 113. The scores on the arithmetic computation section of the SAT ranged from a raw score of 4 to a raw score of 41 with an average score of 19.8. The range of raw scores for the paragraph meaning section was 8 to 57, and the mean score was 39.2. The average year-end grade in mathematics for the sample was 2.53, and for English classes it was 2.6. Scores on the CTP mathematics computation sub-test were 426 to 488 with an average score of 456. The average score on the CTP total reading sub-test was 459 within a range of 420 to 484.

CORRELATION COEFFICIENTS AND T-RATIOS

The lowest correlation coefficient was .399 when comparing the SAT arithmetic computation scores and year-end mathematics grades, while the highest was .562 between the CTP mathematics computation score and the year-end mathematics grade. The correlation between the SAT paragraph

meaning sub-test and the year-end English grade (.457) was greater than the correlation between the SAT arithmetic computation sub-test and the year-end mathematics grade (.399).

There was a greater correlation (.562) between the CTP mathematics computation section and the year-end mathematics grade than the correlation (.401) between the total reading section of that test and the year-end English grade. The coefficients of correlation for the Otis-Lennon I.Q. scores and year-end grades in English and mathematics classes differed by only .027. The correlation with mathematics grades was .430 and for English grades was .457.

The t-ratios ranged from 6.413 for CTP mathematics computation and year-end grades to 4.140 for CTP total reading and year-end English grades. Table I displays the correlation coefficients and t-ratios for the relationships studied. Significance at the .05 and .01 levels for t-ratios at the appropriate degrees of freedom is also indicated. The degree of freedom is the number of pairs of scores minus two.

Otis-Lennon - Mathematics Grade

The coefficient of correlation between the Otis-Lennon I.Q. score and the year-end academic grade in mathematics was computed to be .430 as indicated in Table I. The t-ratios for this coefficient was 4.810. Using the degree of freedom of 102, this is significant at the .05 level (1.984).

TABLE I

COEFFICIENTS OF CORRELATION, T-RATIOS, AND LEVELS OF SIGNIFICANCE

Variables Compared	r_{xy}	Degree of Freedom (N-2)	t-ratio	Level of Significances .01	.05	Degree of Freedom
Otis-Lennon I.Q./ Mathematics Grade, N=104	.430	102	4.810**	2.626	1.984	100
Otis-Lennon I.Q./ English Grade, N=104	.457	102	5.232**	2.626	1.984	100
SAT Arithmetic/ Mathematics Grade, N=93	.399	91	4.163**	2.632	1.987	90
SAT Paragraph Meaning/ English Grade, N=93	.457	91	4.942**	2.632	1.987	90
CTP Mathematics Computation/ Mathematics Grade, N=92	.562	90	6.413**	2.632	1.987	90
CTP Total Reading/ English Grade, N=92	.401	90	4.140**	2.632	1.987	90

**Significant at the .01 level

and the .01 level (2.626).

On the basis of this test, the null hypothesis was rejected at the .01 level of confidence.

Otis-Lennon - English Grade

The relationship between the Otis-Lennon I.Q. scores and the year-end grades in English classes was calculated to have a correlation coefficient of .457 which has a t-ratio of 5.232. Using the same degree of freedom as the previous discussion, this was considered significant at the .05 level (1.984) and the .01 level (2.626). Therefore, the null hypothesis was also rejected for these two variables.

SAT Arithmetic Computation - Mathematics Grade

The correlation between the SAT Arithmetic Computation score and the year-end mathematics grade produced a coefficient of correlation of .399. The t-ratio was 4.163 which resulted in the null hypothesis being rejected for these variables at the .01 level (2.632) using 90 as the degree of freedom.

SAT Paragraph Meaning - English Grade

A .457 coefficient of correlation found for the SAT paragraph meaning sub-test and the year-end English grade was significant at the .01 level also. As displayed in Table I, the t-ratio of 4.942 compared with 1.987 at the .05 level and 2.632 at the .01 level. This led to the

rejection of the null hypothesis for these two variables.

CTP Mathematics Computation - Mathematics Grade

The correlation between the scores of the mathematics computation section of the CTP and the year-end mathematics academic grade was also significant. The t-ratio of 6.413 was again significant at the .01 level of 2.632 as shown in Table I. The null hypothesis was rejected for these variables.

CTP Total Reading - English Grade

Pearson's r_{xy} was computed to be .401 for these pairs of scores on the reading section of the CTP and the year-end grades in English classes. For the degree of freedom of 90, the t-ratio of 4.140 was also significant at the .01 level of 2.632. Again, the null hypothesis was rejected.

SUMMARY

Coefficients of correlation and t-ratios were computed and checked for significance to test the null hypothesis for the relationship between (1) the Otis-Lennon I.Q. scores and mathematics grades, (2) the Otis-Lennon I.Q. scores and English grades, (3) SAT arithmetic computation scores and mathematics grades, (4) SAT paragraph meaning scores and English grades, (5) CTP mathematics computation scores and mathematics grades, and (6) CTP total reading scores and English grades.

The null hypothesis was rejected in each case at the .01 level of significance. Therefore, it was concluded that a significant positive correlation existed between the test scores used for admission to Brownell-Talbot School and subsequent standardized achievement tests and year-end academic grades.

Chapter V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Since Brownell-Talbot uses student scores on the Otis-Lennon Mental Ability Test and the arithmetic computation and paragraph meaning sections of the Stanford Achievement Test as a guideline for accepting applicants, this project studied what relationship, if any, existed between these scores and subsequent achievement at the School. Teacher-assigned year-end grades in English and mathematics classes and scores on the total reading and mathematics computation sections of the Comprehensive Testing Program (CTP) were used to measure student achievement at the School. Correlation coefficients were calculated and t-ratios used to determine the significance of the coefficients of correlation. On the basis of these tests, the null hypothesis was rejected at the .01 level of significance for the relationship between (1) Otis-Lennon I.Q. scores and mathematics grades, (2) Otis-Lennon I.Q. scores and English grades, (3) SAT arithmetic computation scores and mathematics grades, (4) SAT paragraph meaning scores and English grades, (5) CTP mathematics computation scores and mathematics grades, and (6) CTP total reading scores and English grades.

CONCLUSIONS

As a result of this study, a significant correlation was found between the Otis-Lennon I.Q. score and both the year-end academic grade in English and in mathematics at Brownell-Talbot School. This was also true for the relationship between the paragraph meaning and arithmetic computation sections of the Stanford Achievement Test and academic grades in English and mathematics respectively. There was also a positive relationship between the total reading sections of the Comprehensive Testing Program and the year-end grade in English and between the mathematics computation section of the same test and the academic grade in mathematics.

In summary, the admissions testing program currently in use at Brownell-Talbot School adequately predicts future achievement as measured by teacher-assigned academic grades and subsequent achievement testing. The highest coefficients of correlation between entrance tests studied and academic performance, based on academic grades, involved the Otis-Lennon scores and English grades (.457) and the paragraph meaning section of the SAT and English grades (.457). However, neither test can be identified as better than the other as a predictor of future achievement in English classes at Brownell-Talbot.

There was a greater correlation between the Otis-Lennon I.Q. score and the mathematics grade (.439) than

between the arithmetic computation section of the SAT and the mathematics grade (.399). The moderately high correlation between the total reading section of the CTP and English grades (.401) and the CTP mathematics computation test and mathematics grades (.562) suggested that at Brownell-Talbot there is a significant correlation between year-end standardized testing and year-end academic grades assigned by teachers.

Based solely on the statistical information, the suggestion that the Otis-Lennon I.Q. score alone might be an adequate predictor of future success at the School might be made. The flaw in this argument, however, is that some applicants are not accepted at the School although their I.Q. score is above 100. On the basis that their achievement test scores were considerably below grade level, these students were rejected. They would not have been identified if the applicant screening process had not involved an achievement test.

A review of the literature also suggested that other factors be considered in the admissions process. Suggestions to consider for implementation include tests of creativity, teacher recommendations, and a biographical profile of each candidate to add information to the admissions process.

RECOMMENDATIONS

A recommendation that Brownell-Talbot School continue

to use the Otis-Lennon Mental Ability Test and the arithmetic computation and paragraph meaning sections of the Stanford Achievement Test to screen applicants to the School's seventh, eighth, ninth, and tenth grades is supported by the findings of this study. Consideration should be given to substituting the total reading and mathematics computation sections of the Comprehensive Testing Program for the comparable sections of the Stanford Achievement Test currently being used. This is justified in view of the high correlation between the CTP sub-tests and subsequent academic grades as described earlier. It would also provide school officials with a comparison of scores of prospective students to current students.

Another recommendation is for the School to use some sort of a test designed to identify creativity. This should be used on a trial basis in addition to the present program. A study should then be designed to determine the correlation between that test and future academic patterns.

A search should be conducted to find or devise a formal appraisal form to be completed by each applicant's present classroom teacher and returned to Brownell-Talbot for incorporation into the screening process. Qualities to be commented upon should include motivation, past educational background, study skills, and special talents which standardized entrance tests may not measure.

Although it was not one of the purposes of this

study, the difficulty in extracting the data used in the study prompted a realization that record keeping procedures at Brownell-Talbot School should be modernized. The admissions officer should begin keeping records of the test scores and subsequent academic grades of new students apart from the student's cumulative file. A computer system might be employed to simplify the process. Over a period of time, this would build a data base of sufficient size to enable a study of the relationship between entrance tests and subsequent achievement patterns to be conducted on a grade by grade basis.

BIBLIOGRAPHY

Ahlmann, J. Stanley and Marvin D. Glock. Evaluating Pupil Growth: Principles of Tests and Measurements. 5th ed. Boston: Allyn and Bacon, Inc., 1975.

Anastasi, Anne. Psychological Testing. 3rd ed. New York: MacMillan Publishing Company, 1976.

Baldwin, Alexinia. "Tests Can Underpredict: A Case Study," Phi Delta Kappan, 59 (April, 1977), 620-621.

Ballinger, Stanley E. "Of Testing and Its Tyranny," Phi Delta Kappan, 44 (January, 1963), 176-180.

Boyd, William M. II. "SATs and Minorities: The Dangers of Underprediction," Change (November, 1977), 48-49.

Buros, Oscar K. Seventh Mental Measurements Yearbook. New Jersey: Gryphon Press, 1972.

Cattell, Raymond and H. J. Butcher. The Prediction of Achievement and Creativity. Indianapolis: Bobbs-Merrill Company, Inc., 1969.

Chase, Clinton and H. Ludlow. eds. Readings in Educational and Psychological Measurement. Boston: Houghton Mifflin, 1966.

Coles, Gary J. "Do Grade Equivalent Scores Mislead?" School and Community (October, 1977), 20-21.

Ebel, Robert L. "Educational Tests: Valid? Biased? Useful?" Phi Delta Kappan, 58 (October, 1975), 83-88.

Ebel, Robert W. Essentials of Educational Measurement. 3rd ed. Englewood Cliffs, N.J.: Prentice Hall, Inc., 1979.

Fine, Benjamin. The Stranglehold of the I.Q. New York: Doubleday, 1975.

Gordon, Milton A. "The Correlation Between Performance in Secondary School and Performance on the ACT and SAT Test," College and University (Fall, 1976), 107-110.

Green, Robert L. "Tips on Educational Testing: What Teachers and Parents Should Know," Phi Delta Kappan, 56 (October, 1975), 91.

Guilford, J. P. Fundamental Statistics for Psychology and Education. 4th ed. New York: McGraw Hill Book Company, 1965.

Kelley, Truman and others. Stanford Achievement Test, Directions for Administering. New York: Harcourt, Brace, 1964.

Lloyd, R. Grann. Effective and Ineffective Uses of Tests as Indicators of Student Achievement. North Carolina: University of North Carolina Press, 1979.

McDonald, Rita and Roman Gawkoski. "Predictive Value of SAT Scores and High School Achievement of Success in a College Honors Program," Educational and Psychological Measurement, 39 (1979), 411-413.

Miller, Max. "Use of the Stanford Achievement Test as a Predictor of Success on the High School Equivalency Test," Journal of Employment Counseling, 8, 2 (June, 1971), 65-71.

Noll, Victor H. Introduction to Educational Measurement. 2nd ed. Boston: Houghton Mifflin Company, 1965.

Otis, Arthur and Roger Lennon. Otis-Lennon Mental Ability Test: Manual for Administration. New York: Harcourt, Brace & World, 1967.

Pedulla, Joseph, Peter Airasian, and George Madaus. "Teacher Ratings and Standardized Test Results," American Education Research Journal, 17 (Fall, 1980), 307.

Ray, William S. Basic Statistics. New York: Appleton, Century, Crofts, 1968.

Romanow, Concetta V. "The Teacher, the Child, and the Intelligence Test," Chicago Schools Journal (February, 1969), 209-215.

Taylor, Irving and J. W. Getzels. eds. Perspectives in Creativity. Chicago: Aldine Publishing Company, 1975.

Thompson, Bruce. "Predictive Validity of a Measure of Learning Potential," Measurement and Evaluation in Guidance, 12 (July, 1979), 77-81.

Vernon, P. E. "Intelligence Testing and the Nature/Nurture Debate, 1928-1978: What Next," British Journal of Educational Psychology, 49, No. 1, 1-12.

Weiner, Max and Patricia Kay. "Interrelationships among SAT, CLEP, High School and Junior High School Achievement Tests, and High School Average," Educational and Psychological Measurement, 32 (Summer, 1972), 433-437.